

ART. XI.—*Observations on the Pulse and Respiration.* By JOHN M. B. HARDEN, M. D., of Liberty county, Georgia.

THE following observations on the pulse and respiration, although few and imperfect, may not be considered entirely valueless. They have been made upon my own person, in a state of health, in the three postures of lying, sitting, and standing, and while under the influence of various exciting agents; and although the data may be insufficient to allow us to estimate correctly the separate influence of each, they can still be added to that mass of well ascertained facts from which this influence may hereafter be determined, not only in a state of *health*, but of disease also.

The effect of a *change of posture* upon the *pulse* has, for some years past, attracted the attention of physicians. At a meeting of the British Association, held in Dublin, in 1835, a paper was read to the Medical Section, by Dr. M'Donnell, on what he called the "*differential pulse*," in which he asserted his claim to priority in ascertaining it in 1794,* and two or three papers containing very interesting experiments upon the subject, by Wm. Augustus Guy, have been published in the reports of Guy's Hospital, during the years 1838 and 1839.† As introductory to my own observations I will detail the results of these experiments. Having been made on a number of individuals by an intelligent and cautious hand, they are entitled to our respectful consideration.

In his first paper he gives experiments made upon males of the mean age of 27 years. In them he found the pulse to be as follows: standing, 79; sitting, 70; lying, 67. When all exceptions are excluded the numbers are standing, 81; sitting, 71; lying, 66. In his second paper his experiments are upon females of the same mean age. In them he found the pulse to be standing, 89; sitting, 82; lying, 80; or when all exceptions are excluded the numbers are standing, 91; sitting, 84; lying, 80.

From the whole of his experiments the following conclusions are drawn. First, the pulse of the adult female exceeds in frequency the pulse of the adult male by from 10 to 14 beats. Secondly, the effect of change of posture on the pulse is much greater in the male than in the female, and the disproportion is more marked in early youth. Thirdly, the exceptions to the general rule are more numerous in females than in males. Fourthly, the effect of change of posture is less in early youth than in the adult, and the modifying influence of age is greater in the female than in the male. Fifthly, the exceptions to the general rule are more numerous in early youth than in the adult. Sixthly, the effect produced by change of posture increases directly as the increase of the frequency of the pulse. Seventhly, the excep-

* Philos. Magazine, N. S. vol. 8, p. 63. An interesting abstract of this paper may be found in the Am. Jour. Med. Science, vol. 18, p. 199.

† Med. Chir. Rev. vol. 33, p. 615, and vol. 34, p. 182.

tions to the general rule are more numerous as the pulse is less frequent. Eighthly, the exceptions are more numerous as the effect of the change of posture is less. Ninthly, the effect of the change of posture on the same frequency of pulse in the afternoon, forenoon, and evening is as the numbers 8, 9, and 10.

Mr. Guy was, at first, disposed to believe that the effect of the change of posture was dependent upon muscular contraction. To determine the point he made some experiments with a horizontal board to which the subject of the experiment was secured, in such a manner, that his body might be conveyed from the erect position to any angle with the horizon, without the necessity for any muscular effort. There was no important variation between the results of these and former experiments, whence he concludes that the "effect produced upon the pulse by change of posture is not due to muscular contraction by which the posture is changed," a fact which had been previously ascertained by Dr. M'Donnell by a similar method.*

By the same method also, the body was conveyed from the horizontal to the inverted position with the head downwards and the feet in the air, and although, as might have been expected from the uncasiness of the position, the exceptions were numerous, yet the general results show conclusively that the diminution in the frequency of the pulse steadily increases from the horizontal to the inverted posture, whence the inference is plain that the frequency of the pulse is a *maximum in the erect*, and a *minimum in the inverted posture of the body*.

I now proceed to give in a tabular form my experiments upon this subject, which will be found to include the effect of posture upon the *respiration* as well as upon the *pulse*, between which in health there is always a determinate and a constant ratio. I have also connected with them observations of the thermometer at the same hours in order to ascertain if possible the influence of temperature. The difficulty of doing this, however, is greatly increased by the fact that I was almost always under the influence of an artificial temperature differing from the true temperature of the air by many degrees. As food and exercise always produce a marked effect upon the pulse and respiration, I have given, in the remarks accompanying the table, the different articles of diet and the exercise taken during the continuance of the experiments.

It may be objected by some that these experiments are vitiated by the influence which mental attention to any bodily organ has over its action; an influence which Dr. Holland has made the theme of a distinct dissertation, and of which any one may satisfy himself by the least examination. But to this we may reply in the words of Edwards,† "Si quelquefois la volonté y intervient ce n'est que pour de courts instans. Ils suivent habituellement une marche réglée où la même nombre de mouvemens se reproduit dans le même intervalles de temps."

* See the paper above alluded to.

† D l'influence des agens Physiques, p. 295-6.

Table of Observations on my own Pulse and Respiration.

Nov.	Pulse.			Respira.			Ther.	Remarks.	1879.
	Ly.	St.	Sd.	Ly.	St.	Sd.			
2nd.							Fah.		Weather.
7 A. M.	64	68	76	13	16	20	57	Breakfast of buckwheat between 8 & 9—Kode	Cloudy.
1 P. M.	63	72	84	14	16	18	71	13 miles between this & 1 P. M.	Damp.
3 P. M.	72	76	83	16	18	20	71	Moderate din. of beef soup, chick & homony.	
7 P. M.	72	76	83	14	15	18	63	Walked 2 miles since this hour.	Wind S. E.
11 P. M.	60	61	70	10	12	11	65	Eat no supper, drank milk and water.	
3d.									
7 A. M.	60	60	65	10	13	15	59	Before and just after rising from bed.	
1 P. M.	60	68	80	13	13	15	63	Full breakfast of B. wheat & beefsteak—Rest.	Cloudy, damp,
3 P. M.	68	72	84	14	14	15	62	Just after din. of beef, homony, milk & pota.	dark day.
7 P. M.	61	68	78	14	16	18	60	Cigar since 3, just after supper of bread, milk and water.	Drizzle.
11 P. M.	60	61	71	11	14	16	56	No exercise to-day.	Wind variable.
4th.									
7 A. M.	59	71	78	11	13	16	52	Before and just after rising—breakfast buckwheat, and beefsteaks.	Slight rain
1 P. M.	51	90	100	15	20	22	63	Just after manual exercise & walking 2 miles	last night.
3 P. M.	87	85	90	17	18	18	66	Just after dinner of duck, ham, homony, pota-to-pudding.	And this morning
7 P. M.	71	76	80	14	16	18	61	Manual exercise, no supper, milk and water, taste of coffee.	cloudy.
11 P. M.	60	61	68	12	14	16	58	Just after playing on flute for half an hour.	Wind N. E.
5th.									
7 A. M.	60	66	76	10	12	15	60	Before and just after rising.	
1 P. M.	71	72	85	11	15	20	73	Aft. riding 20 m., feet wet with rain; headache	Cloudy.
3 P. M.	72	78	83	12	11	16	79	After riding 5 m. more, beef soup for dinner.	Moderate rain.
7 P. M.	63	76	80	00	15	17	71	Just after an oyster supper.	Wind S. & S. W.
11 P. M.	68	70	80	13	14	16	71	Headache.	
6th.									
7 A. M.	60	72	72	10	12	14	53	Before and after rising—Headache.	
1 P. M.	74	78	81	14	14	16	64	Just after riding 27 miles—Headache.	Clear
3 P. M.	71	76	83	16	16	17	61	Just after dinner of chicken and ham.	Wind
7 P. M.	63	70	81	11	12	14	50	Just after drinking buttermilk & water.	N. & N. W.
11 P. M.	59	59	68	12	14	16	40	Headache relieved, but have slight cold.	
7th.									
7 A. M.	60	74	70	12	15	16	41	Before & after rising—Break., B. wheat, ham.	Frost, clear.
1 P. M.	64	74	76	12	14	16	58	Kode 10 miles since breakfast.	
3 P. M.	74	78	90	16	18	20	39	After dinner of dove, ham, potatoes, homony, buttermilk.	Wind N. W.
7 P. M.	72	70	84	14	16	18	54	After eating bread & milk, walking 2 miles.	
11 P. M.	51	59	68	11	14	14	47	Reading since supper.	Cloudy evening.
8th.									
7 A. M.	60	66	70	10	10	12	31	Before and after rising, breakfast buckwheat and milk.	Ice.
1 P. M.	65	72	86	12	15	18	57	Rest. Reading all the morning.	
3 P. M.	72	74	84	12	12	14	59	After eating chick., ham, rice, potatoes, milk.	Clear.
7 P. M.	64	66	81	14	16	18	46	Rest. Supper, milk and water.	Wind N. W.
11 P. M.	54	56	66	12	15	15	36	Rest. Reading.	
9th.									
7 A. M.	58	64	72	12	14	16	28	Before and just after rising.	
1 P. M.	70	74	86	14	16	18	59	Breakfast buckwheat, cigar, rest, reading.	Clear.
3 P. M.	80	84	92	16	16	18	62	After eating duck, ham, homony, pota., milk.	
7 P. M.	00	00	00	00	00	00	46	Being under temporary excitement omitted.	Wind N. W.
11 P. M.	60	60	68	13	14	15	31	Supper, bread and milk.	
10th.									
7 A. M.	60	72	74	10	10	12	36	Before and after rising from bed.	
1 P. M.	80	76	92	11	13	16	60	After riding 8 miles and walking quarter mile	Clear.
3 P. M.	74	72	84	12	14	16	62	After riding 8 m. more & eating ham & bread	
7 P. M.	76	78	88	12	15	16	45	After drinking milk for supper.	Wind N. E.
11 P. M.	60	62	68	12	14	15	34	Rest.	
15th.									
7 A. M.	64	68	82	11	13	15	60	Before and after rising from bed.	
1 P. M.	76	88	98	15	17	18	81	Breakfast of buckwheat, walked 2 mile, cold, feel badly.	Clear.
3 P. M.	68	76	84	13	15	18	81	After eating rice and chicken.	Cloudy.
7 P. M.	60	68	80	12	14	16	70	After eating wheat bread.	
11 P. M.	54	56	68	12	11	16	64	Rest. Reading.	Wind S. & S. W.
16th.									
7 A. M.	60	68	72	10	11	11	62	Before and after rising. Breakfast as usual.	
1 P. M.	72	68	81	12	13	16	69	Rest—Reading—some headache.	Cloudy.
3 P. M.	70	72	84	13	15	16	63	After eating ham, chick., homony, pota., milk	Rain last
7 P. M.	60	62	70	12	14	14	65	After eating a little cake & drink. weak coffee	night.
11 P. M.	54	54	58	12	12	13	60	Rest—Reading.	Wind W.
Mean	66	70	80	12	14	16	58	In round numbers—omitting fractions.	

Remarks on the Table.—1. It will be perceived by reference to the table that, at a mean temperature of 58° of Fahrenheit, which is near the mean for the whole year in this latitude, the mean of from 53 to 55 observations in my own pulse gives the following numbers:—Lying 66; sitting 70; standing 80. By comparing these numbers with those obtained by Mr. Guy, the correspondence will be seen to be very striking, and the more so because the comparison is between the mean pulse of one individual and that of a number experimented on by that gentleman.

2. The numbers of respirations at the same temperature are, lying 12, sitting 14, standing 16; showing a marked correspondence between the pulse and respiration, the same ratio being preserved between the separate means of each individual posture, and the mean of the three postures taken collectively. This ratio, it will be perceived, is 5 : 1—that is five pulses to one respiration, which agrees very nearly with the result obtained by Dr. M'Donnell.* This is certainly an important fact, and may be used to much advantage in the diagnosis and prognosis of disease. I have never known this ratio disturbed to any extent except in bad cases.

3. In order to estimate the influence of temperature, I have compared the mean of two days' observations between which there was the greatest difference in mean temperature, while the other conditions remain nearly the same. For this purpose I have chosen the 1st and 7th, and 2d and 8th. On the first day while the mean temperature was 66° the mean pulse was 72, and the mean respiration 15. On the seventh, the mean temperature being 45° , the mean pulse was 66, and the mean respiration 13—showing obviously an increase of frequency in an increased temperature. But a comparison of the second and eighth days' observations gives a different result. On the former, while the mean temperature was 60° , the mean pulse was 69, and the mean respiration 14—on the latter day the mean temperature being 15° , the mean pulse was 72, and the mean respiration 15. Taking the four days' observations connectedly, however, it will be found that while on the two first days the temperature was 63° , the pulse was 70, and the respiration $14\frac{1}{2}$ —and while on the two latter days the temperature was 45° , the pulse was 69, and the respiration 14, tending to establish the law of *increased frequency by increased temperature*, a result opposed to the experiments and observations of Edwards.† This result, however, should be received with hesitation, from the circumstance, before alluded to, of my having been subjected to an artificial temperature, which must, of course, have modified the influence of the temperature of the air.

4. To determine the ratio of the *diurnal variation* in the pulse and respiration, I have taken the mean of the observations in the three postures at three different periods of the day separated from one another by an interval

* Dr. M'Donnell says from four to six pulses for one respiration.

† De l'Influen. des Agens Physiques.

of eight hours; that is, at 7 A. M., 3 P. M., and 11 P. M., and I find the numbers to be as follows:—at 11 P. M. pulse 62, respiration $13\frac{1}{2}$; at 7 A. M. pulse 64, respiration 13; at 3 P. M. pulse 79, respiration 15. From which it appears that the pulse is slowest in the evening, respiration slowest in the morning, and both most increased in frequency in the afternoon; the ratio of increase between the pulse in the evening and morning being 1 : 1.03, and in the afternoon 1 : 1.28; the ratio between the respiration in the evening and morning being nearly that of equality, and in the evening and afternoon it is as 1 : 1.15. It is possible that the difference in frequency between the pulse in the morning and evening is owing to the absence of light, since the other conditions remain nearly the same, unless we recur to the old hypothesis of exhausted excitability. The difference between the frequency of both the pulse and respiration in the morning and afternoon is no doubt dependent upon the conjoined agency of light, heat, food and exercise; but the conditions of the problem are much too complicated for us to determine satisfactorily the separate influence of each. To do this will require still further observations, and it is to be hoped that the subject will yet receive that attention which its importance demands.

ART. XII.—*On the Curability of Insanity.* BY PLINY EARLE, M. D.

SINCE, in different individuals, mental power and its manifestation by speech and action are nearly as diverse as the configuration of the head and the expression of the face, it is evident that the adoption of a fixed standard of intellectual and moral integrity, or of *sanity*, is beyond the bounds of possibility. That which is sanity in one man would be strong evidence of derangement in another. The criterion by which to form a judgment must vary with every individual, and, in each case, that criterion must be the physical, mental, and moral condition of the patient previously to the attack of insanity. Yet, in many cases, it is a point of the greatest difficulty to determine when a perfect restoration is effected. Some patients, by dissimulation, or an evasion of all allusion to the prominent topics of their delusion, may deceive, and thus determine a false, though, in reference to their wishes, it be a favourable decision. In others, the approximation to a normal state of the mental faculties may be so near as to induce the physician, who was unacquainted with them previously to the invasion of the disease, to pronounce them cured, while their intimate friends would still detect eccentricities of both thought and action. Hence, acute perceptive powers, sagacity, a sound judgment, and, not unfrequently, recourse to the opinion of the friends of the patient, are necessary to an accurate judgment. In a given case, one